

Title of the project

AquaRevive

Team member

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Video Link:

<https://youtu.be/Gy4g8QAddGg>

Github Link:

https://git.arts.ac.uk/22018506/Creative_Making_FinalProject

Vision statement & summary of the project idea

In the groundbreaking VR project "AquaRevive," players are transported into a sensory-based immersive VR experience. Tasked with combating algal bloom pollution, players find themselves submerged in an underwater world marred by the destructive effects of algal blooms. To restore the ecosystem's health, players must exterminate the algal blooms to clean up the polluted waters and rescue endangered marine life. The visual and auditory immersion will mimic the underwater environment to represent the scenery best and provide the player with a singular experience of the complex dynamics of algal bloom pollution. Get ready to dive into an unforgettable journey of environmental restoration.

The goal of the project

Our project allows players to raise awareness about the issue of algal bloom pollution and its detrimental impact on marine ecosystems. By actively engaging players in the mission to combat algal bloom pollution, the project seeks to foster a sense of environmental responsibility and empower individuals to take action in their own lives to protect and preserve our fragile aquatic ecosystems. We hope this experience ultimately transforms our players to become more pro-environment in real life.

We choose the first-person perspective in our game, the player is able to look through the character's eyes and see the world from their perspective. By looking through the character's eyes, the player gets a sense that they are actually inside the world of the game, and it is easier for the player to interact with the world of the game. Additionally, the character becomes a blank slate for the player, the player can project themselves onto the game. It feels less like they are controlling a game character than they are the character.

Visual style of the project

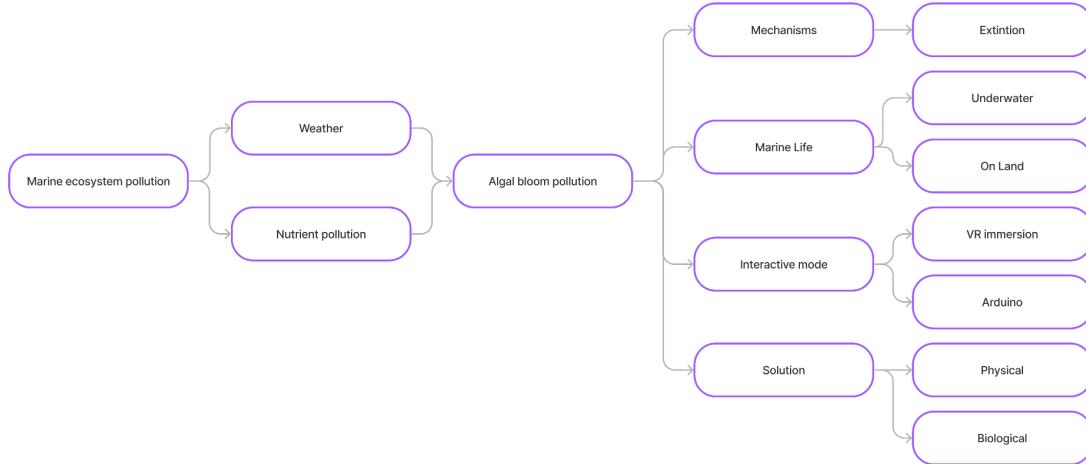
The visual style of our project is semi-realistic. We want our environment to be visually stunning but at the same time make it realistic enough for the participant to relate to the real world.

- <https://www.pinterest.co.uk/pin/70437487129119/>
- https://www.pinterest.co.uk/pin/110267890871456421/feedback/?invite_code=377a280af0dd403b9007c4f2c09bfb2a&sender_id=851954591917412605
- https://www.pinterest.ca/pin/675821487846664734/sent/?invite_code=fb226f1e8ae54e9b8c92ffbd65cb2411&sender=626000554362959835&sfo=1

Midjourney:

- https://cdn.discordapp.com/attachments/1100587170718294128/1100795970398208000/ZoeXiong_mutable_Clusters_of_glowing_dot_sunder_water_game_sce_eae96c4d-bbc2-44cc-af8a-47f768afd80e.png
- https://cdn.discordapp.com/attachments/989739763957391370/1100583920254328872/ZoeXiong_and_earth_luminous_transparent_plants_93d47b11-acd4-47c6-9d6a-d995ec411790.png
- https://cdn.discordapp.com/attachments/1100587170718294128/1100796288255131778/ZoeXiong_Translucent_luminous_chlorellas_under_water_like_a_lot_b8a40ec1-2b1d-49f7-8843-b89542dc0132.png

Project Inspiration



Relevant Research

The pollution causing harmful algal blooms

<https://www.bbc.com/future/article/20230110-the-pollution-causing-harmful-algal-blooms>

Rising temperatures and pollution have led to an explosive growth of harmful algal blooms, contaminating our drinking water and harming human health.

U.S. National Office for harmful algal blooms

<https://hab.whoi.edu/response/control-and-treatment/>

Methods and technologies to control or suppress blooms fall under four broadly defined categories:

Physical control, Biological control, Chemical control, and Environmental control.

Narrative/Story

AquaRevive is a thrilling and fast-paced VR game set inside a giant glass dome. The dome serves as your battleground against the destructive forces of algal bloom pollution. As an elite defender of the environment, you find yourself armed with a unique and powerful weapon: a bucket of dynamic chemical balls that can wreak havoc on the encroaching algal blooms.

The narrative begins as you step into the dome, where its walls come alive with illuminated targets representing the algal blooms. Your mission is to destroy these targets and save the ecosystem from the devastating effects of algal blooms.

As the game unfolds, waves of targets appear before you, challenging your speed and accuracy. You must swiftly strike the ball, launching it with precision to smash into the targets, clearing them one by one in a limited time.

Beyond the action-packed gameplay, the narrative highlights the importance of strategic thinking, adaptability, and environmental preservation. As you immerse yourself in the virtual world, you become acutely aware of the devastating impact of algal blooms on the environment and the urgent need to combat this ecological threat.

Storyboard

phase/scene	Pre-VR	Transition into VR	VR experience	Exit from VR
Real-world	Instructions/precautions for the experience.	The player enters the booth.	The player uses joysticks to navigate and interact with the game environment and start on the assigned task.	The user exits the VR environment using joysticks to press the exit button and take off the headset.
Virtual environment	The environment would be loaded into the computer.	The player can see the hand triggers and a screen with a start button to be clicked on to start the game.	The player uses joysticks to extinct algal blooms.	Asking the players how they feel about the experience.

Non-visual perception	Nothing particular	The player gets a brief introduction to the task.	The player can hear the background music.	Nothing particular
Cognition	By introducing the VR experience to the player, we will establish a connection between them and the story.	During this time we want players to think wow I feel like I am actually under the sea.	We want the player to get used to the basic controls of the game, and understand the theme of the game.	We want the player to reflect on the game experience.

VR Mechanics

The project is built with Universal Render Pipeline under the Unity platform and run by the built-in play mode function. The display device is Oculus Quest 2.

Basic Controls:

Movement is JOYSTICK based

To Grab Objects

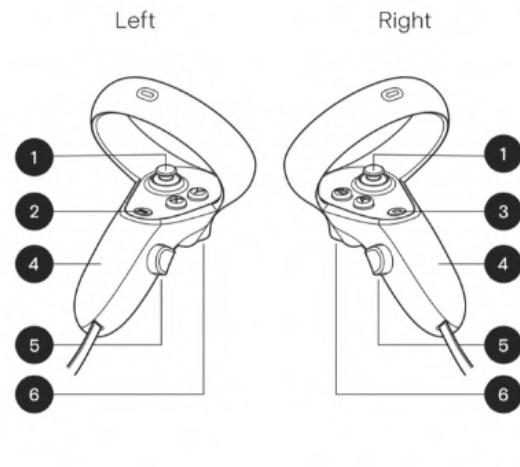
Please use the GRIP button to grab via the Ray when pointing at objects.

To Throw Objects

Please use the GRIP button to throw.

To interact with UI

Please press the TRIGGER button to interact with UI via the Ray.



Core mechanics

Our core mechanics is to allow players to use dynamic chemical balls to destroy targets representing algal blooms, all within the confines of a giant glass dome. The dynamic and fast-paced nature of the gameplay keeps players engaged.

- Giant Glass Dome: The game is set inside a glass dome, providing an immersive environment where players engage in action-packed gameplay.
- Dynamic Balls: Players control a bucket of chemical balls that serve as their primary weapon against the algal bloom targets. When the ball collides with the glass dome, it will disappear. Players need to plan shots accordingly to avoid losing the ball prematurely.

- Target Destruction: Players must destroy the algal blooms by striking them with chemical balls. Each successful hit eliminates a target from the field.
- Wave-Based Gameplay: Targets appear in waves, increasing in difficulty and complexity as the game progresses. Players must destroy all targets in each wave to advance to the next.
- Time Pressure: The game emphasizes speed and quick thinking. Players must act swiftly to destroy targets before time runs out.

Secondary mechanics

The number of players: 1

Target audience: people who are interested in learning about the effect of algal bloom pollution.

Procedures: Along with the instructions for the experience, players can put on all the equipment(HMD & two controllers).

Why our project is innovative

Main “selling point”

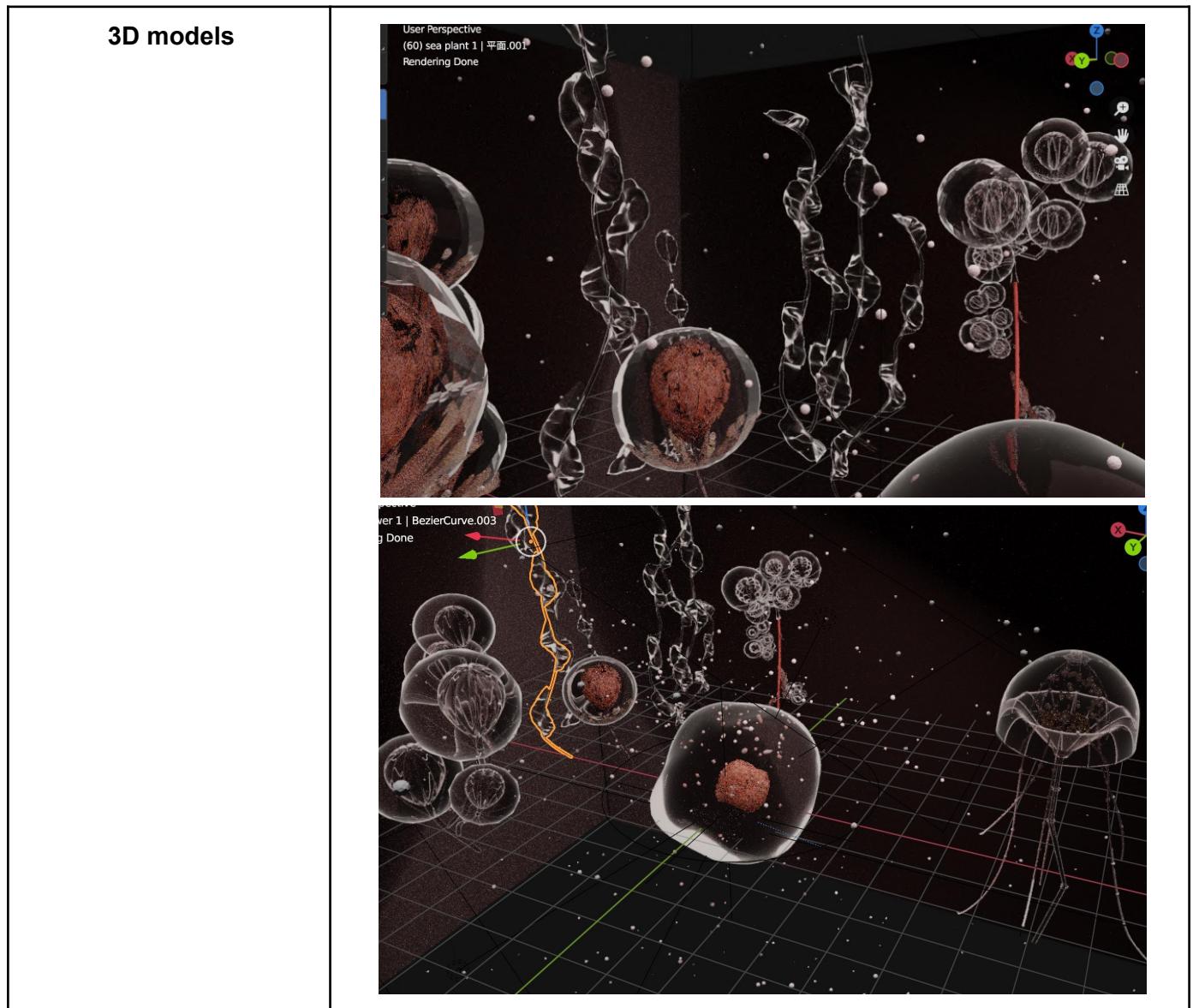
The game goes beyond entertainment by raising awareness about the pressing issue of algal bloom pollution. Players learn about the causes, impacts, and importance of combating algal blooms through gameplay and narrative elements.

Problems encountered and solutions

1. We got feedback from playtesters that the environment took them out of the immersive experience, and the game mechanics were not engaging. To address these concerns, we recreated assets, such as adding fog and bubble/sunshine particle effects to mimic the underwater environment. Additionally, we made the game mechanics more engaging by introducing targets on the walls of the glass dome. Each target has different properties, requiring specific techniques or multiple strikes to eliminate them. This innovative change added depth and challenge to the gameplay.
2. UI elements in the normal 3D environment we designed at the beginning couldn't be effectively used in the VR environment, it contains some 2D elements and overlays that obstruct the player's view. To keep the UI design clean, minimalist, and non-intrusive, we redesigned UI elements aimed to prevent clutter and maintain immersion, enhancing the overall VR experience.
3. The dynamic ball didn't provide the desired level of realism. To solve this, we wrote a script called "Ball Thrower" to add force and velocity to balls. We also made continuously playtested and fine-tune the ball's behaviour, adjusting parameters like gravity, restitution, and friction, to ensure a satisfying and authentic bouncing experience. Additionally, we add visual cues, such as the emission effects of the ball, to highlight the ball.
4. We encountered a significant challenge in creating an engaging experience that effectively conveyed the urgency and impact of algal bloom pollution. We realized that simply providing players with a task to solve the pollution issue lacked a sense of consequence. To address this, we introduced a game-over condition where the ocean becomes engulfed by algal blooms if players fail. This posed a design challenge of balancing difficulty and motivation, ensuring that players felt a tangible sense of responsibility and urgency to succeed.

5. To address the challenge of repeated generation of the game target, we implemented a script called "ObjectGenerator". By utilizing loops, we enable the target object to regenerate after it has been hit and disappeared. The "ObjectGenerator" script manages a list to store the spawn positions for the targets. By attaching specific game objects to these positions, we achieve the random generation of the target in different locations each time.

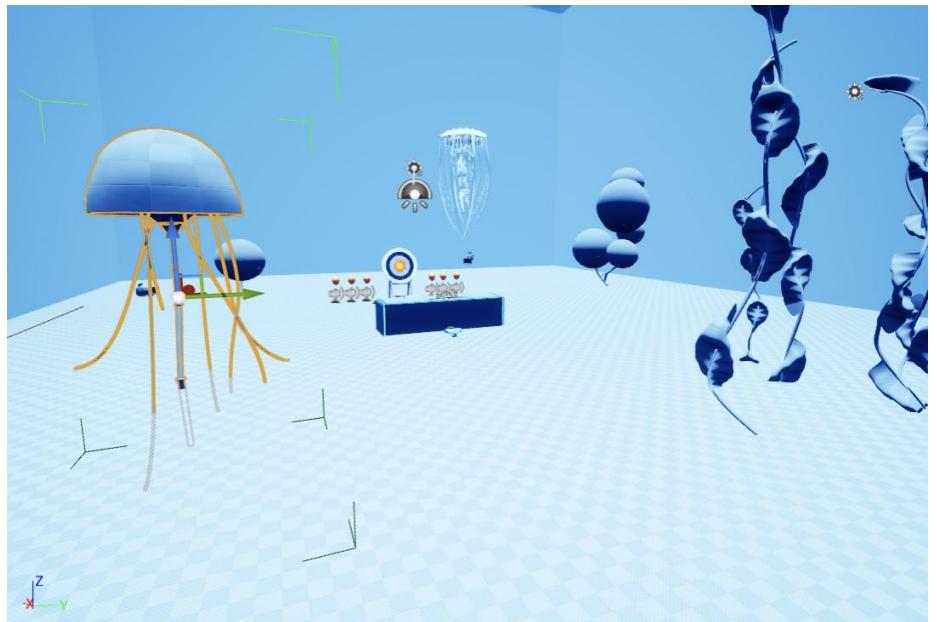
Prototyping process





(Marine life models)

Scene first version

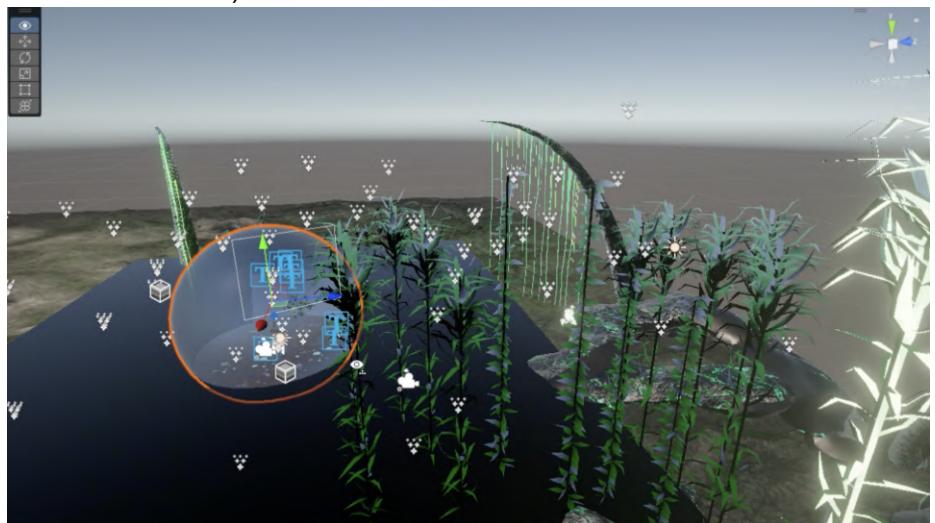


(Underwater scene)

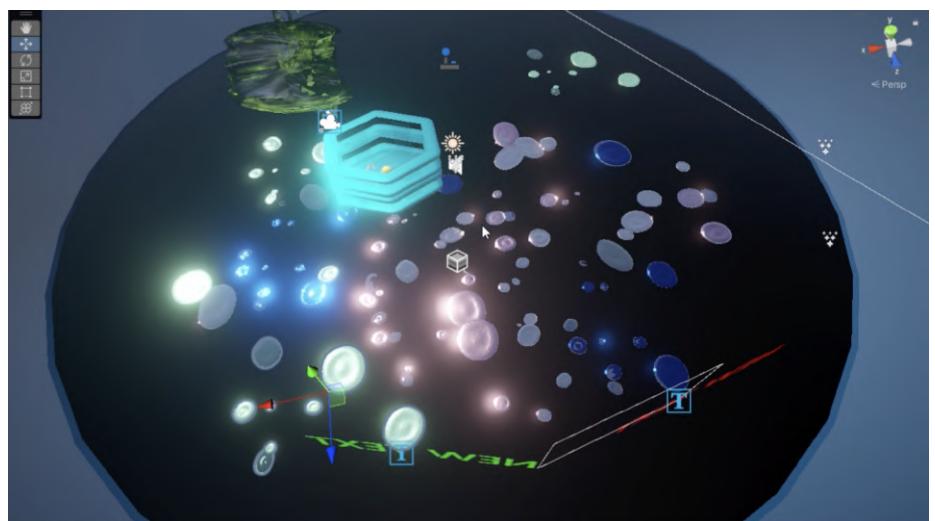
Scene second version



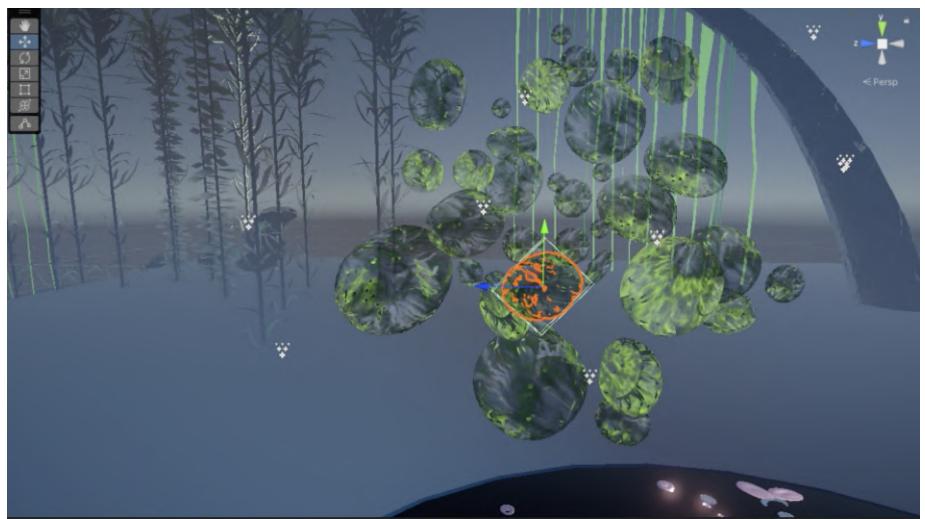
(Underwater scene)



(Underwater scene)



(Glass dome inside view first version)



(Algal bloom first version)



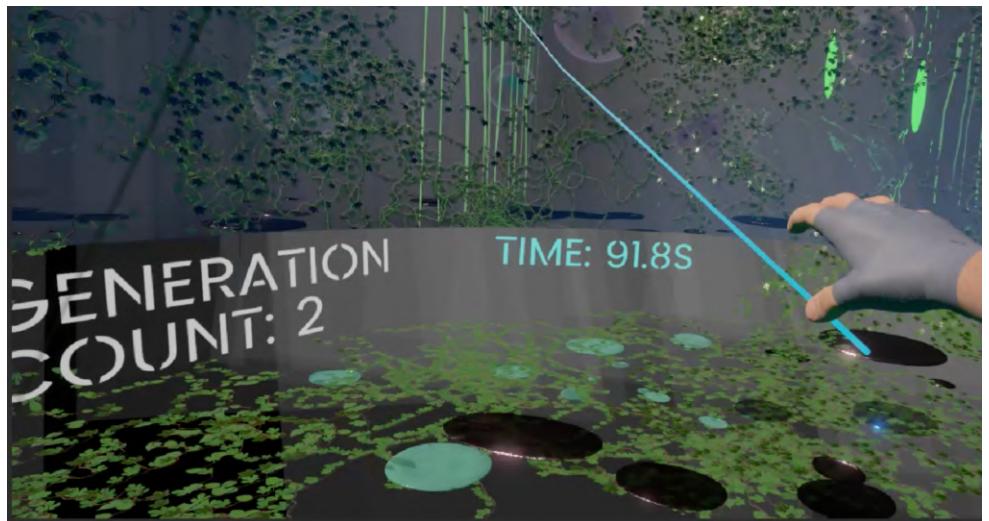
(Game play VR view)

Playtesting

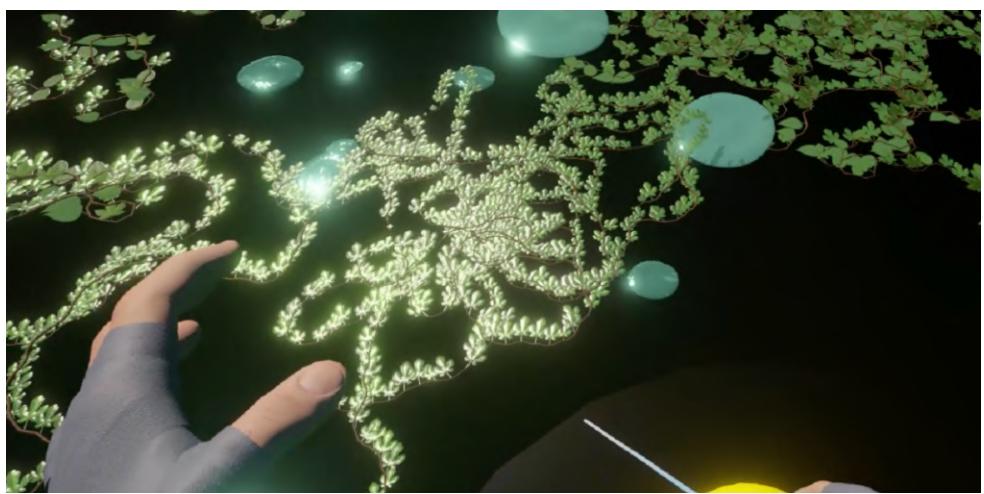




VR implementation



(Counter UI: Time & Ball)



(VR hands Animation)

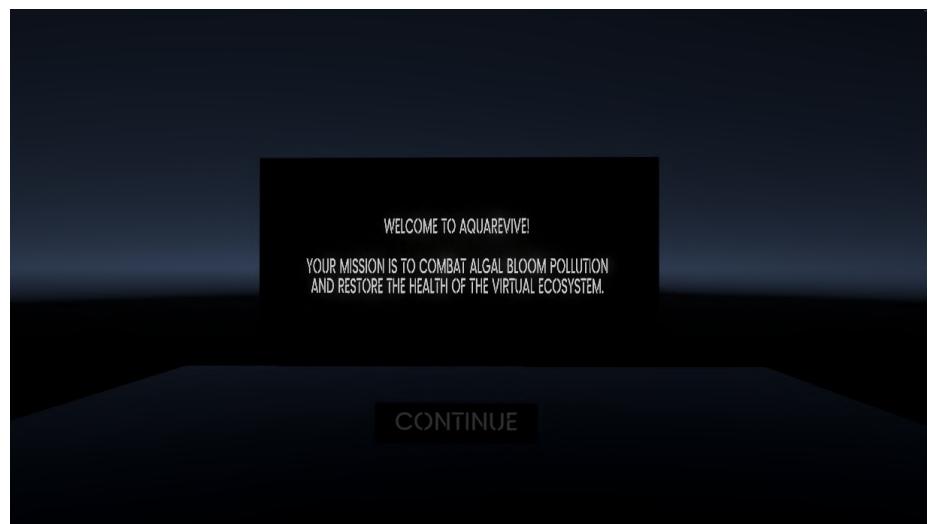


(VR controller interacts with target - algal bloom)

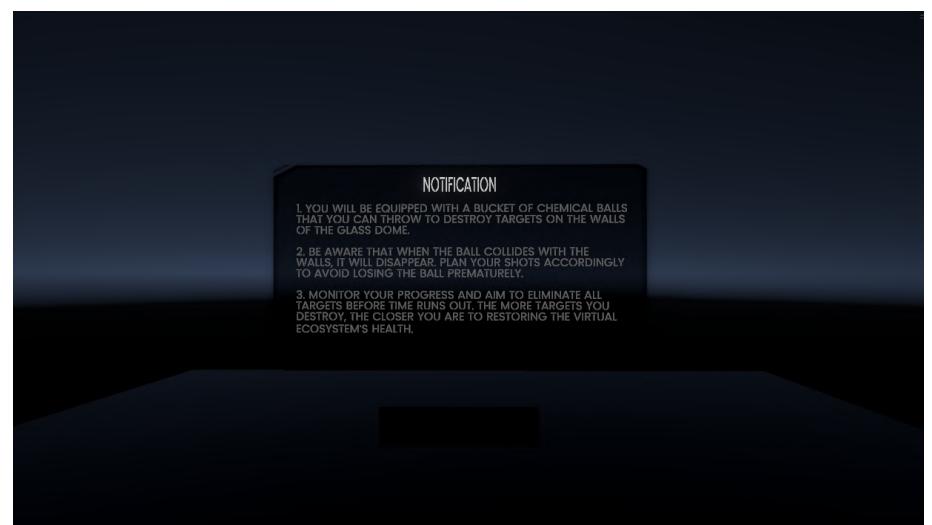
Scene final version



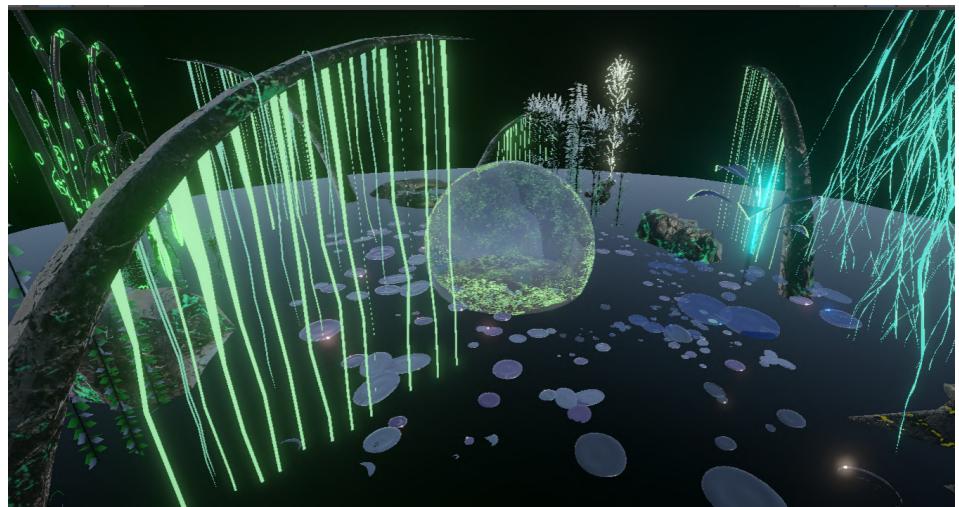
(Beginning Scene)



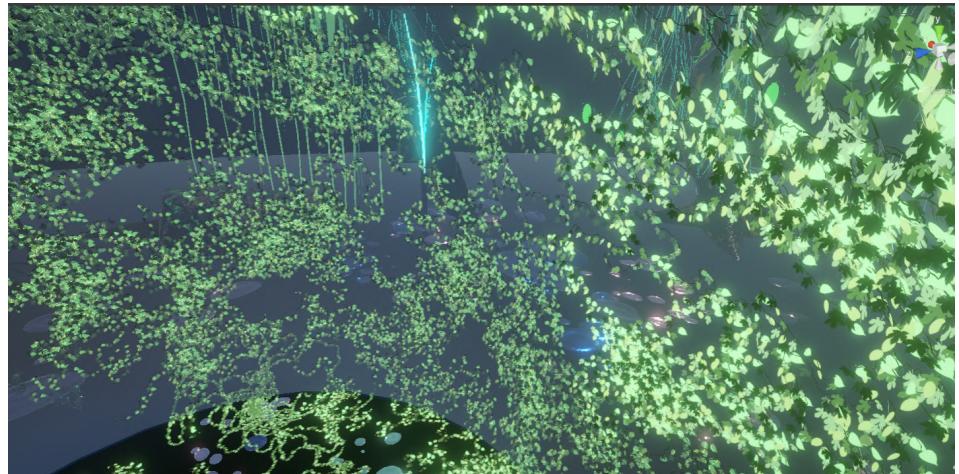
(Game Introduction1)



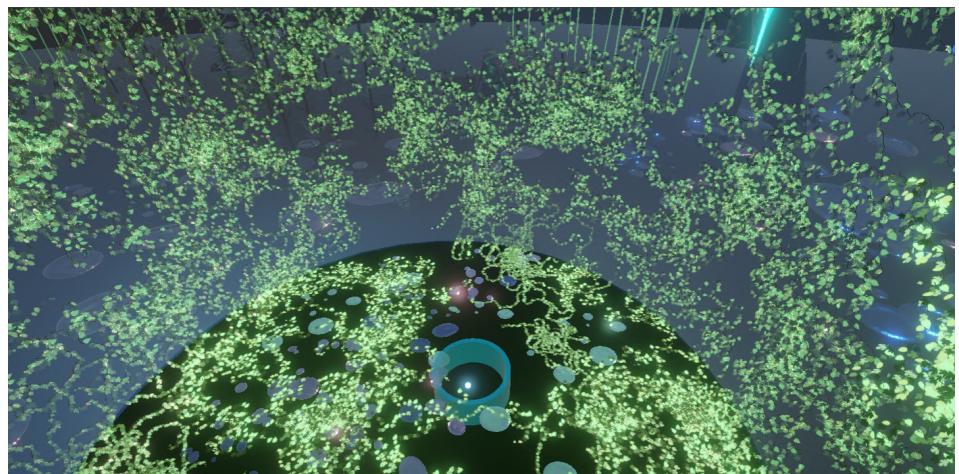
(Game Introduction2)



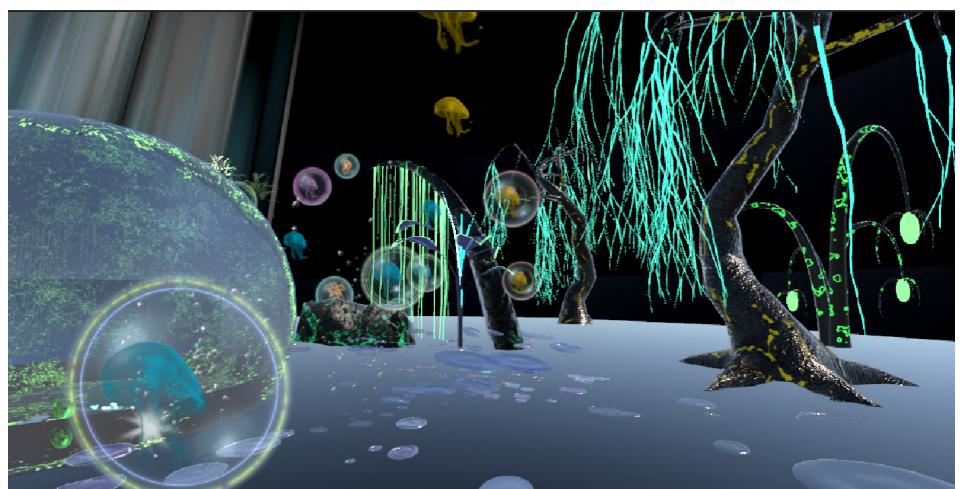
(Game Scene Outside)



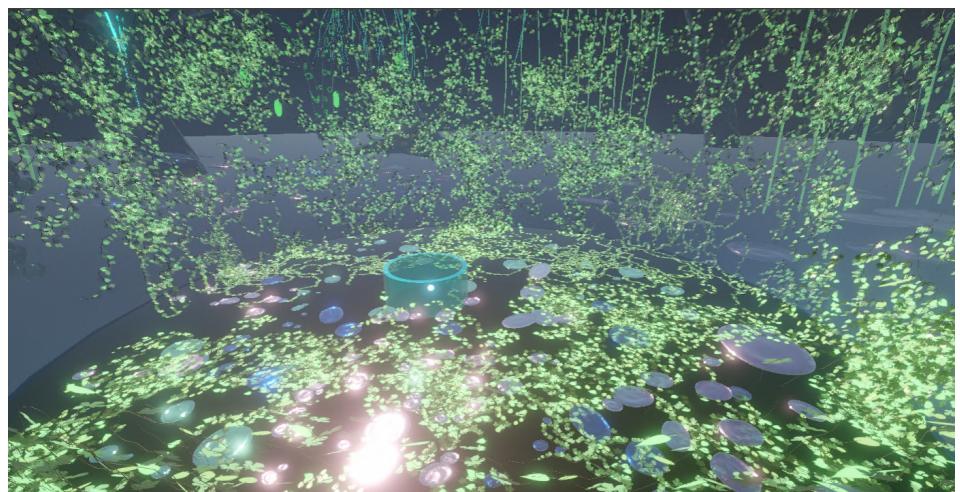
(Glass dome inside view)



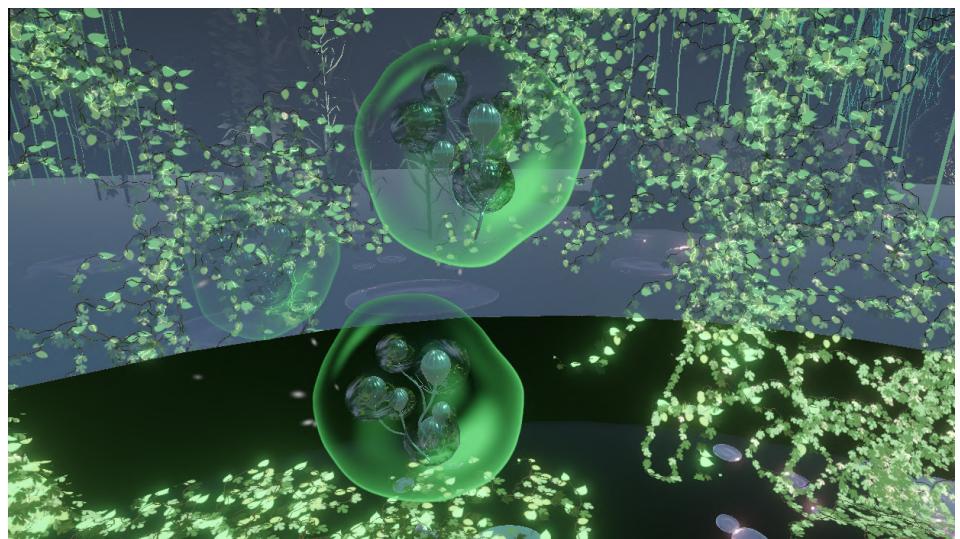
(Glass dome inside view)



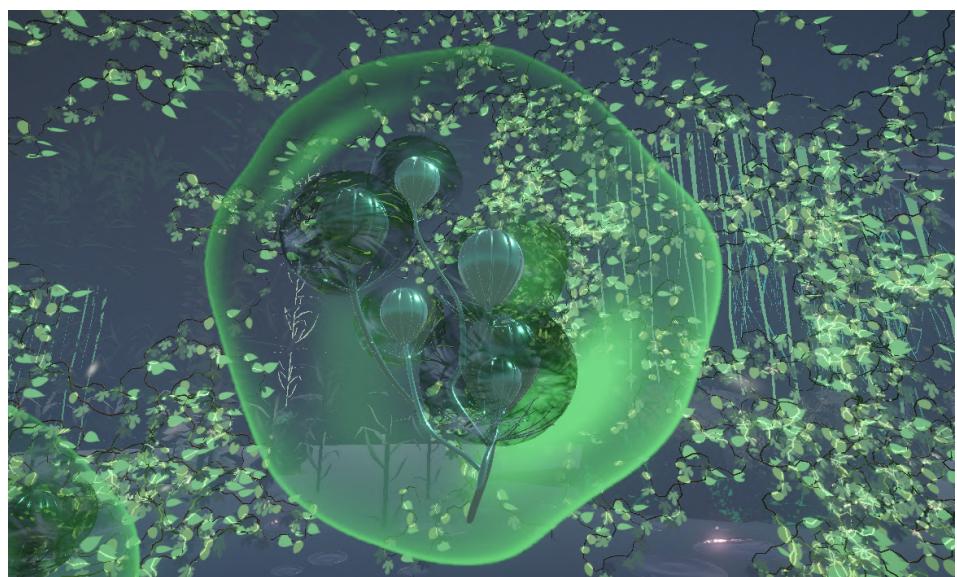
(Game Scene Outside)



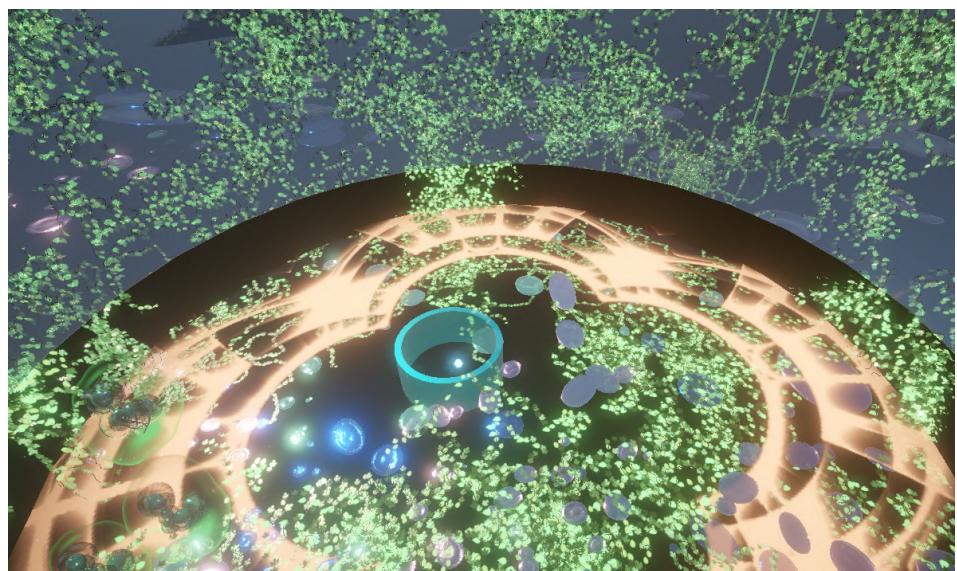
(Glass dome inside view)



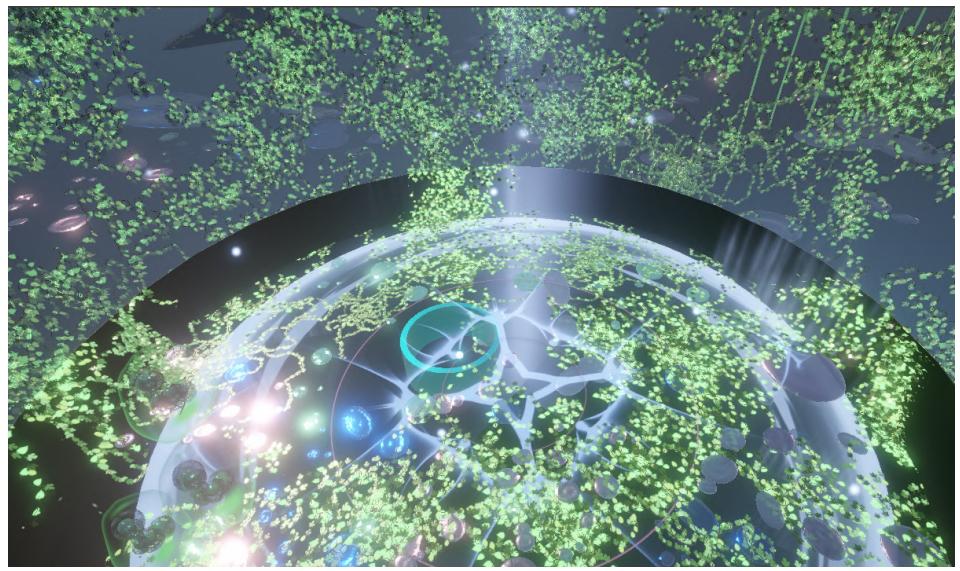
(Algal Bloom final version)



(Algal Bloom final version)



(Fail to eliminate target effect)



(Successfully eliminated target effect)

Development process

May 01: We first laid out the storyboard and different narrative beats so we will know how the story will progress. Next, we used Blender to create the assets and textures needed to construct a scene so our scene will look consistent. Afterwards, we split our work into respective roles, effects, 3D modelling and so on. We each completed the given tasks within the due time, allowing us to merge the project together.

May 08: Recognizing the need for a more visually appealing experience, we decided to enhance the assets by adding an Emission effect. However, we encountered a challenge as the normal mode in the Unity platform did not support shader rendering for this effect. To overcome this, we rebuild the project using the Universal Render Pipeline (URP) to enhance the overall visual quality of the game.

May 15: We focused on VR setup during this phase, such as implementing hand-object interaction using joysticks, and mimicking the dynamic ball in real-world behaviour. By solving this problem, we tweaked the ball's physical properties, such as mass and friction to optimise gravity and collisions, making the interaction feel more realistic and intuitive.

May 22: We playtested our project and got some feedback about the environment, game mechanics and sound/script from playtesters. We took the feedback to improve the movement around the space so that it will decrease the chances of motion sickness. We received comments that the environment took them out of the immersive experience and that the game mechanics could be more engaging. From this feedback, we looked into how we could improve/change this.

May 29: During this phase of our project, to provide a more immersive experience, we recreated some assets to suit the player better such as adding some bubble/sunshine particle effects, fog and background music. To make the game mechanics more engaging, targets appear on the walls of the glass shield, and players must destroy them by hitting them with the ball. Each target may have different properties, requiring specific techniques or multiple strikes to eliminate them.

June 05: We focused on UI elements for this phase, the UI we set in the 3D gameplay can't be used in a VR environment, then we need to redesign UI elements to keep the UI design clean, minimalistic, and non-intrusive to prevent clutter and maintain immersion.

June 10: During the last phase of our project, we diligently optimized the game scene and assets through continuous playtesting, particularly the depiction of algal blooms. Our aim was to immerse players in an engaging experience that conveys the urgency of the situation. In line with this, we introduced a consequence for failure - if players lose the game, the algal blooms will overwhelm and engulf the ocean. This added challenge adds depth and significance to the gameplay, compelling players to strive for success and motivating them to take decisive action against algal bloom pollution.

Technical Documentation:

Coding references:

VR controller reference(Unity XR interaction Toolkit):

<https://docs.unity3d.com/Packages/com.unity.xr.interaction.toolkit@2.3/manual/installation.html>

Parts of codes formed with the help of [ChatGPT](#)(Debugging, Modifying, Rephrasing etc.)

3D Assets

Bubble Particles: <https://assetstore.unity.com/packages/3d/characters/bubble-particles-2d-3d-7565>

Neon Alien World:

<https://assetstore.unity.com/packages/3d/environments/sci-fi/neon-alien-world-198725>

Ivy: <https://assetstore.unity.com/?q=ivy&orderBy=1>

Audio Assets

Background music: Who says so https://www.youtube.com/watch?v=hdRUT_HUqpU

hit impact: <https://freesound.org/people/carlmartin/sounds/158927/>

Video Clips Resources

<https://www.youtube.com/watch?v=FGAJizX5gv0>

<https://www.youtube.com/watch?v=JtU2HhenVPY>